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The Mechanisms of Renal Autoregulational Dysfunction in Dahl Salt Sensitive Rats

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Summary

In hypertensive vascular disorders, it is well-known that a pathological change in endothelial cells occurs in the early stage of hypertension. Dysfunction of the endothelial cells is caused by an imbalance between reactive oxygen species (ROS) and nitric oxide (NO). In hypertensive renal disease, the pathological change arises in small renal arteries at an early stage, and subsequently glomerular injury occurs. The mechanism of this early pathological change in small renal arteries in hypertensive renal disease has not been clarified. We hypothesed that decreasing NO and increasing ROS may contribute to endothelial dysfunction of the renal arteriole, and can cause a loss of renal autoregulation in hypertensive renal disease and improvement of the NO/ROS imbalance may ameliorate renal autoregulation. The aim of this study is to clarify the cause of NO/ROS imbalance, to clarify the resistance of renal autoregulation in hypertensive renal disease and to investigate the effects of ARB on improvement of the NO/ROS imbalance in the renal arterioles of hypertensive renal disease.

Increased ROS production and decreased NO production were seen in the glomeruli and arterioles of hypertensive kidney disease. ROS production in the glomeruli and arterioles in the hypertensive kidney was diminished by incubation with DPI, L-NAME or BH4. Telmisartan administration improved the imbalance between NO and ROS in glomeruli and arterioles. eNOS production was decreased in the DS-H group. These changes were improved by Telmisartan treatment. Nitrotyrosine formation was increased in the hypertensive kidney disease with Hydralazine treatment. The renal vascular resistance with perfusion pressure was decreased in hypertensive kidney disease. Renal vascular resistance was improved by Telmisartan treatment.

In conclusion, the NO/ROS imbalance contributes to dysfunction of autoregulation in the preglomerular arteries and the ARB improves NO/ROS imbalance and reduces dysfunction of the autoregulation in the hypertensive renal disease.